

The Major in Information Systems

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www.cmu.edu/information-systems (<http://www.cmu.edu/information-systems/>)

Did you enjoy computer science or more technical courses in high school, but are mostly interested in the practical and social applications of technology? Do you have a passion for business and want to use advanced technology to change how companies work? Do you want to learn how data and technology can be harnessed for social good?

Carnegie Mellon University's **Information Systems (IS) program**, a joint degree program between the Heinz College and Dietrich College of Humanities and Social Sciences is strongly technical, drawing from Carnegie Mellon's leadership in computer science, human-centered design, business management and software engineering. It is deeply rooted in the humanities and social sciences, allowing students the lifelong benefits of a rich liberal arts education. And it provides pathways for students to find their own Information Systems niche through advanced study and research with leading researchers. As a result, our graduates are uniquely positioned to envision and drive the positive organizational change that technology makes possible.

Artificial intelligence. Machine learning. Deep learning. Big data. Social networks. Neural networks. Robotics. Automated voice assistants. Blockchain. Driverless vehicles.

Do you want to use technologies like these to benefit companies, governments, and society? CMU offers the world's best undergraduate IS program and will help you do just that. In fact, many of the world-changing technologies listed above were invented here on campus—there is no better place to become a tech leader than CMU.

The field of Information Systems involves the effective design, delivery, and use of information and communications technologies to solve problems for companies, governments, and society. Equally, it is about understanding and measuring the impacts of these technologies on people and communities so they can be deployed ethically.

As an IS student, you will build a solid foundation in computing, communications, and software development. You will also study social sciences and organizational theory to develop "big picture" critical thinking and understand the human impacts of technological change. This blend prepares you to take a leading role in our digital future. The flexible nature of the program encourages students to explore their own interests through program electives, study in a contemporary concentration or through optional second majors and minors.

IS students are well prepared to pursue graduate work in a wide range of fields. For students interested in master's degree-level graduate work at Carnegie Mellon, there are many possibilities, including accelerated Masters degree programs in Information Systems Management, Human Computer Interaction, Information Security Policy and Management, Engineering Technology and Innovation Management, and Business Administration.

IS graduates continue to be in high demand in the information-age workplace. There has been a strong job market for IS students in recent years, and national trends indicate that this is likely to continue. IS majors often take jobs in consulting companies, major software firms, large corporations, and start-up companies. Internship opportunities closely parallel the job market.

In addition to General Education Requirements and basic prerequisites in Mathematics and Computer Science, The IS program curriculum includes:

- A broad grounding in humanities and social sciences to promote self-directed learning, critical thinking, and interdisciplinary problem-solving.
- An Information Systems Core to provide the technology, project management, and business-facing skills needed to design and build effective real-world systems solutions.

- An Information Systems Breadth focused on professional communications, quantitative analysis, and how technology functions in society.
- A Concentration that gives you the flexibility and agency to gain expertise in a supporting area and define your own niche in IS.

The IS major is the perfect place for you if you are passionate about using technology for positive gains across society, both economic and humanistic.

IS Commitment on Diversity & Inclusion:

Diversity, equity and inclusion are core values of the Information Systems Program. We strive to foster a community that promotes inclusiveness and a positive sense of belonging among all students within the program. Together, we value and celebrate the unique identities of our students and aim to create a culture where they feel empowered to share their experiences and ideas, and engage in meaningful academic, leadership, and social opportunities. We aim to elevate cultural awareness through education, programming, and an environment that embraces differences.

Study Abroad Options in Information Systems:

Given the importance of globalization, we encourage students to consider expanding their international experience by spending a semester studying abroad. The IS program is very flexible in allowing students to pursue these opportunities. With careful planning, study abroad is possible during most semesters. Students interested in study abroad should talk with the IS Academic Advisor to help plan an appropriate course of study. With prior approval, study abroad courses may be applied to major requirements.

Information Systems as Additional Major or Minor:

Information Systems is not available as either an additional major or minor.

Curriculum

The Information Systems major is offered only as a Bachelor of Science (B.S.) degree. In addition to major requirements outlined below, all Information Systems students must fulfill the General Education requirements for the Dietrich College of Humanities and Social Sciences. A total of 360 units is required for the degree.

Requirements are subject to revision. Advisor approval is required for each student's major curriculum plan. Any proposed course substitutions to courses required for the IS major must be approved in advance by the IS Academic Advisor.

Technical Core (Prerequisites)

Information Systems requires completion of prerequisite courses in Mathematics and Computer Science. All prerequisites must be successfully completed prior to the start of Fall semester, junior year.

Mathematics

Complete one of the following math courses:

		Units
21-112	Calculus II (pre-requisite of 21-111)	10
21-120	Differential and Integral Calculus	10
21-127	Concepts of Mathematics	12
21-240	Matrix Algebra with Applications	10
80-210	Logic and Proofs	9

Computer Science

Three Computer Science courses are required. To maintain normal progress toward the Information Systems degree, students must complete 15-121 Introduction to Data Structures prior to the start of Spring Semester, sophomore year.

Students entering the program as freshmen will have the option to complete a Computer Science Placement Test. Depending on appropriate Advanced Placement credit and/or results of the Computer Science Placement Test, entering students may place directly into 15-112 (<http://coursecatalog.web.cmu.edu/search/?P=15-112>) or 15-121 (<http://coursecatalog.web.cmu.edu/search/?P=15-121>). 15-110 (<http://coursecatalog.web.cmu.edu/search/?P=15-110>) is taken as the first Computer Science prerequisite unless a student places directly into 15-112 (<http://coursecatalog.web.cmu.edu/search/?P=15-112>) or 15-121 (<http://coursecatalog.web.cmu.edu/search/?P=15-121>).

coursecatalog.web.cmu.edu/search/?P=15-121). Students that do not gain a placement into 15-112 (<http://coursecatalog.web.cmu.edu/search/?P=15-112>) or 15-121 (<http://coursecatalog.web.cmu.edu/search/?P=15-121>) must begin the sequence with 15-110 (<http://coursecatalog.web.cmu.edu/search/?P=15-110>) and must complete it with a grade of D or above prior to entering 15-112 (<http://coursecatalog.web.cmu.edu/search/?P=15-112>).

		Units
15-110	Principles of Computing	10
15-112	Fundamentals of Programming and Computer Science	12
15-121	Introduction to Data Structures	10

Note: Students cannot receive credit for both 15-104 Introduction to Computing for Creative Practice and 15-110 Principles of Computing. Students may also take 15-122 (<http://coursecatalog.web.cmu.edu/search/?P=15-122>) Principles of Imperative Computation in place of 15-121 (<http://coursecatalog.web.cmu.edu/search/?P=15-121>) Introduction to Data Structures but should first consult with their academic advisor prior to doing so.

Information Systems Core

In the Information Systems Core, students will learn the basic skills necessary to analyze, design, implement, and test high-quality, cost effective information systems. The Information Systems Core consists of seven courses (not including 67-100 and 67-200).

Complete all of these courses:

		Units
67-100	Information Systems First Year Colloquium	1
67-200	Information Systems Research Colloquium	1
67-250	The Information Systems Milieux (Spring Semester Only)	9
67-262	Database Design and Development (Fall Semester Only)	9
67-272	Application Design and Development (Spring Semester Only)	12
67-373	Information Systems Consulting Project (Spring Semester Only)	12
17-313	Foundations of Software Engineering	12
95-422	Managing Digital Transformation	9

Complete one of these three courses:

		Units
05-391	Designing Human Centered Software	12
05-410	User-Centered Research and Evaluation	12
05-452	Service Design	12

Information Systems Breadth

In the Information Systems Breadth, students will study key areas fundamental to understanding and solving problems in information systems. At least one course is required from each of the following categories:

Professional Communications

Information systems professionals communicate with a wide range of people in most organizations and often facilitate communications between diverse groups of stakeholders. Consequently, the most successful professionals typically are those with strong communication skills. These courses help students see that the structure and presentation of information affects how well (and how easily) it can be understood and used.

Complete one of the following courses:

		Units
05-317	Design of Artificial Intelligence Products	12
36-315	Statistical Graphics and Visualization	9
51-261	Design Center: Communication & Digital Design Fundamentals	9
or 51-262	Design Center: CD Fundamentals: Design for Interactions for Communications	
67-265	Design Fundamentals: Shaping Interactions and Experiences	9
67-338	Information & Grid Design	9
70-321	Negotiation and Conflict Resolution	9
70-340	Business Communications	9
70-342	Managing Across Cultures	9
70-350	Acting for Business	9

76-270	Writing for the Professions	9
84-250	Writing for Political Science and Policy	9
88-418	Negotiation: Strategies and Behavioral Insights	9
88-419	International Negotiation	9
88-341	Team Dynamics and Leadership	9
or 70-341	Team Dynamics and Leadership	

Quantitative Analysis and Research Methods

This area focuses on decision making and data analysis — essential to development of useful information systems. This area exposes students to analytic methods in the social sciences and quantitative methods for approaching complex methods.

Complete one of the following courses:

		Units
21-257	Models and Methods for Optimization	9
36-202	Methods for Statistics & Data Science	9
36-225	Introduction to Probability Theory	9
36-235	Probability and Statistical Inference I	9
36-303	Sampling, Survey and Society	9
36-309	Experimental Design for Behavioral & Social Sciences	9
36-315	Statistical Graphics and Visualization	9
36-350	Statistical Computing	9
36-401	Modern Regression	9
36-402	Advanced Methods for Data Analysis	9
67-285	Across the Universe from Intelligent Agents to Users	9
67-364	Practical Data Science	9
73-265	Economics and Data Science	9
80-305	Game Theory	9
80-306	Decision Theory	9
88-223	Decision Analysis	12
88-251	Empirical Research Methods	9
88-252	Cause and Effect	9

Innovation and Entrepreneurship

The focus of this area is to apply disciplined techniques to generate ideas that have value in a market, and bring them through design, feasibility testing, and frequent revision, towards a potential launch. Students must complete 67-272 Application Design & Development in order to fulfill one of the courses below towards their Innovation and Entrepreneurship requirement.

Complete one of the following courses:

		Units
05-470	Digital Service Innovation	12
17-356	Software Engineering for Startups	12
67-443	Mobile Application Design and Development	12
94-491	Lean Innovation Lab	12

Information systems concentration

The study of Information Systems can take many paths; **Concentrations** allow students to find the path that best suits their plans and aspirations. They also allow students to establish relationships with leading researchers in their area of interest.

IS Concentrations include:

- Data Analytics
- Health Information Systems
- Technology & Arts Enterprises
- Technology & International Development
- User Experience (UX) Design

Alternatively, students may choose from an approved list of minors or additional majors, including those offered through the Integrative Design, Arts, and Technology (IDeATe) (<https://ideate.cmu.edu/undergraduate-programs/>) initiative that blend information systems and the arts as only Carnegie Mellon University can.

IDeATe minors:

- Game Design (<https://ideate.cmu.edu/undergraduate-programs/game-design/>)

- Animation & Special Effects (<https://ideate.cmu.edu/undergraduate-programs/animation-special-effects/>)
- Design for Learning (<https://ideate.cmu.edu/undergraduate-programs/learning-media/>)
- Media Design (<https://ideate.cmu.edu/undergraduate-programs/media-design/>)
- Soft Technologies
- Sonic Arts (<https://ideate.cmu.edu/undergraduate-programs/sound-design/>)
- Innovation & Entrepreneurship (<https://ideate.cmu.edu/undergraduate-programs/innovation-and-entrepreneurship/>)
- Intelligent Environments (<https://ideate.cmu.edu/undergraduate-programs/intelligent-environments/>)
- Physical Computing (<https://ideate.cmu.edu/undergraduate-programs/physical-computing/>)
- Immersive Technologies in Arts & Culture (<https://ideate.cmu.edu/undergraduate-programs/immersive-technologies-in-arts-culture/>)

Other approved minors and additional majors include:

- Artificial Intelligence (<https://www.cs.cmu.edu/bs-in-artificial-intelligence/minor/>)
- Business Analytics and Optimization (<http://coursecatalog.web.cmu.edu/schools-colleges/tepper/undergraduatebusinessadministrationprogram/#minorinbusinessanalyticsoptimizationtextcontainer>)
- Computational Biology (<https://cbd.cmu.edu/education/undergraduate/minor-in-computational-biology.html>)
- Computational Finance (<http://coursecatalog.web.cmu.edu/intercollegeprograms/#majorinorincomputationalfinancetext>)
- Computer Science (<http://coursecatalog.web.cmu.edu/schools-colleges/schoolofcomputerscience/undergraduatecomputerscience/#computerscienceminortext>)
- Cybersecurity & International Conflict (<http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/instituteforpoliticsandstrategy/#minorincybersecurityandinternationalconflicttext>)
- Decision Analytics & Systems (<https://www.heinz.cmu.edu/programs/decision-analytics-and-systems/>)
- Decision Science (<http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/departmentofsocialanddecisionsciences/#minortextcontainer>)
- Economics (<http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/undergraduateeconomicsprogram/#minoreconomicstext>)
- Economics & Statistics (<http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/departmentofstatistics/#econstattextcontainer>)
- Engineering Studies (<http://coursecatalog.web.cmu.edu/schools-colleges/collegeofengineering/minorsfornonengineeringstudents/#text>)
- Human-Computer Interaction (<http://coursecatalog.web.cmu.edu/schools-colleges/schoolofcomputerscience/addlmajorsminors/#humancomputerinteractionminortext>)
- Humanities Analytics (<https://www.cmu.edu/dietrich/english/academic-programs/humanities-analytics/ha-minor.html>)
- Information Security, Privacy and Policy (<https://www.isri.cmu.edu/education/undergrad/ispp-minor/>)
- Language Technologies (<http://coursecatalog.web.cmu.edu/schools-colleges/schoolofcomputerscience/addlmajorsminors/#languagetechnologiesminortext>)
- Machine Learning (<http://coursecatalog.web.cmu.edu/schools-colleges/schoolofcomputerscience/addlmajorsminors/#machinelearningminortext>)
- Neural Computation (<http://coursecatalog.web.cmu.edu/schools-colleges/schoolofcomputerscience/addlmajorsminors/#neuralcomputationminortext>)
- Operations & Supply Chain Management (<http://coursecatalog.web.cmu.edu/schools-colleges/tepper/undergraduatebusinessadministrationprogram/#minorinoperationsandsupplychainmanagementtext>)
- Policy & Management (<http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/departmentofsocialanddecisionsciences/#minorinpolicyandmanagementtextcontainer>)
- Robotics (<http://coursecatalog.web.cmu.edu/schools-colleges/schoolofcomputerscience/addlmajorsminors/#roboticsminortext>)

- Science, Technology & Society (<http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/interdepartmentalminors/#sciencetechnologyandsocietytext>)
- Software Engineering (<http://coursecatalog.web.cmu.edu/schools-colleges/schoolofcomputerscience/addlmajorsminors/#softwareengineeringminortext>)
- Statistics (<http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/departmentofstatistics/#minortext>)
- Technology & Policy (<http://coursecatalog.web.cmu.edu/schools-colleges/collegeofengineering/minorsfornonengineeringstudents/#text>)

The following areas are available as a second major only:

- Behavioral Economics, Policy, and Organizations (BEPO) (<http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/departmentofsocialanddecisionsciences/#majorinbehavioraleconomicspolicyandorganizationstextcontainer>)
- Business Administration (<http://coursecatalog.web.cmu.edu/schools-colleges/tepper/undergraduatebusinessadministrationprogram/#additionalmajortextcontainer>)
- Cognitive Science (<https://www.cmu.edu/dietrich/psychology/undergraduate/prospective-students/academics/cognitive-science/>)
- Economics & Statistics (<http://coursecatalog.web.cmu.edu/schools-colleges/tepper/undergraduateeconomicsprogram/#dualdegreeadditionalmajortext>)
- Engineering & Public Policy (<http://coursecatalog.web.cmu.edu/schools-colleges/collegeofengineering/departmentofengineeringandpublicpolicy/#doublemajorcurriculumtext>)
- Statistics & Machine Learning (<http://coursecatalog.web.cmu.edu/schools-colleges/dietrichcollegeofhumanitiesandsocialsciences/departmentofstatistics/#statsmltextcontainer>)

Sample Curriculum

First-Year		Second-Year	
Fall	Spring	Fall	Spring
67-100 Information Systems First Year Colloquium	67-250 The Information Systems Milieux	67-262 Database Design and Development	67-272 Application Design and Development
15-110 Principles of Computing	15-112 Fundamentals of Programming and Computer Science	15-121 Introduction to Data Structures	Quantitative Analysis Requirement
36-200 Reasoning with Data	Grand Challenge Seminar	Professional Communications Requirement	General Education Course
76-101 Interpretation and Argument or other approved first-year writing options	General Education Course	General Education Course	General Education Course
Math Requirement	General Education Course	Elective Course	Elective Course
Elective Course			
99-101 Computing @ Carnegie Mellon			

Third-Year		Fourth-Year	
Fall	Spring	Fall	Spring
17-313 Foundations of Software Engineering	67-373 Information Systems Consulting Project	95-422 Managing Digital Transformation	Concentration Course
Concentration Course	Concentration Course	Concentration Course	General Education Course
HCI Requirement	General Education Course	General Education Course	Elective Course
General Education Course	Elective Course	Innovation & Entrepreneurship Requirement	Elective Course
Elective Course	Elective Course	Elective Course	Elective Course

Academic Policies

Transfer into Information Systems

Applications will be considered based on the following criteria:

- Completion of 15-112 Fundamentals of Programming and Computer Science with final grade of 'B' is required; a final grade of 'A' is preferred

- Completion of 15-121 or 15-122 is preferred, with a grade of 'B' or higher
- Strong record of academic performance at Carnegie Mellon (minimum QPA of 3.5 required)
- Personal statement (1-2 pages single spaced) on the following topic: *In your personal statement, please describe how your academic and career goals relate to the Information Systems Program. Please discuss your previous experiences that have led you to pursue the IS major, and how IS aligns with your future goals and aspirations. You may also discuss any other IS related experiences (e.g. internships, course projects, research, co-curricular experiences, etc.) or relevant coursework.*
- Interview with an IS Academic Advisor: IS advisor appointments should be made with the appropriate advisor (based on student last name) via the links on the advising page (<https://cms-staging.andrew.cmu.edu/information-systems-4/current-students/advising.html>) and should be completed by the deadline set forth for the current semester.
- Sample course plan through graduation (4th semester applicants only) When making your plan, we strongly recommend utilizing Stellic. The only Dietrich General Education course that will be waived is the Grand Challenge Seminar.

Application (<https://forms.gle/9XFDdy31avh8LW326/>) materials must be submitted no later than the last day of classes of the fall or spring semester. Students admitted into the IS Program will be officially declared in the semester following their application to the IS Program. If admitted, students will be declared as an IS major prior to the start of the following semester. All internal transfer students will be required to take 67-200: IS Research Colloquium during the first fall semester of their IS enrollment.

Students interested in applying for transfer to the Information Systems major should contact an IS Academic Advisor (<https://cms-staging.andrew.cmu.edu/information-systems-4/current-students/advising.html>) for information regarding availability, application procedures, and deadlines.

Double Counting of Courses

"Double Counting" refers to instances when a course taken to fulfill one requirement counts simultaneously toward a requirement in another major or minor program. Double Counting is permitted in the Dietrich College on a very limited basis. Information Systems students may double count no more than two courses towards an additional major and one towards a minor. There is no restriction on double counting for courses satisfying the Dietrich College General Education requirements and IS Prerequisite courses. Students must also adhere to any policy restrictions on double counting enforced by the academic department of the student's additional major or minor.

Course Repeats

Per university policy, when a course is repeated, all grades will be recorded on the official academic transcript and will be calculated in the student's QPA. This is the case regardless if the first grade for the course is a passing or failing grade.

Undergraduate students who wish to repeat a course already passed must obtain approval from the student's Dean or Department Head. When a student takes a course they already passed, only one set of units will count towards graduation requirements.

Faculty

MOHAMMAD AAZAM, Assistant Teaching Professor - Ph.D., Kyung Hee University ; Carnegie Mellon, 2022-

CHADI AOUN, Teaching Professor - Ph.D., Univeristy of New South Wales; Carnegie Mellon, 2015-

HOUDA BOUAMOR , Associate Teaching Professor - Ph.D., Paris-Sud University ; Carnegie Mellon, 2012-

ANIS CHARFI, Associate Teaching Professor - Dr.Ing., Technische Universitat Darmstadt; Carnegie Mellon, 2015-

SUSAN HAGAN, Associate Teaching Professor - Ph.D., Carnegie Mellon University; Carnegie Mellon, 2004-

C.F. LARRY HEIMANN, Teaching Professor - Ph.D., Washington University (St. Louis); Carnegie Mellon, 1998-

SHIHONG HUANG, Teaching Professor - Ph.D., University of California, Riverside; Carnegie Mellon, 2023-

NAAMA ILANI-TZAR, Assistant Teaching Professor - Ph.D , Ben-Gurion University of the Negev; Carnegie Mellon, 2023-

DIVAKARAN LIGINLAL, Teaching Professor - Ph.D., University of Arizona - Tucson; Carnegie Mellon, 2009-

SELMA LIMAM MANSAR, Teaching Professor Emeritus - Ph.D., National Polytechnic Institute of Grenoble; Carnegie Mellon, 2007-

JOSEPH S. MERTZ, Faculty Director, Teaching Professor (joint Appointment with Heinz College) - Ph.D., Carnegie Mellon University; Carnegie Mellon, 1997-

SARA MOUSSAWI, Associate Teaching Professor - Ph.D. , City University of New York; Carnegie Mellon, 2016--

DANIEL PHELPS, Area Head, Information Systems Qatar and Associate Teaching Professor - Ph.D., Florida State University; Carnegie Mellon, 2007-

JULIA POEPPING, Associate Director of Partnership Development - Masters, University of Pittsburgh ; Carnegie Mellon, 2019-

JERIA QUESENBERRY, Teaching Professor & Dietrich College Associate Dean of Faculty - Ph.D., Pennsylvania State University; Carnegie Mellon, 2007-

RAJA SOORIAMURTHI, Teaching Professor - Ph.D., Indiana University; Carnegie Mellon, 2007-

XIAOYING TU, Assistant Teaching Professor - Ph.D., Carnegie Mellon University; Carnegie Mellon, 2020-

SAVANID (NUI) VATANASAKDAKUL, Associate Teaching Professor - Ph.D., University of New South Wales; Carnegie Mellon, 2018-

RANDY S. WEINBERG, Teaching Professor Emeritus - Ph.D., University of Minnesota; Carnegie Mellon, 1998-